

REMARKS

This amendment is in response to a final Office action (Paper No. 9) dated September 12, 2002. Upon entry of this amendment, claims 2, 3, 6, 9, 27, 36 and 37 will be pending in this application. Applicants have amended claims 2 and 27 by this amendment and have newly added claims 36 and 37 this amendment and have canceled claims 1, 4, 5, 7, 8, 10, 15-19, 26 and 28-35 without prejudice or disclaimer as to their subject matter by this amendment.

In Paper No. 9, the Examiner protested an amendment to the specification made by Applicants in Paper No. 8. In Paper No. 8, Applicants inserted a paragraph in the specification between paragraphs 0057 and 0058 that the Examiner deemed to be a 35 U.S.C. § 132 new matter issue. Specifically, the Examiner deemed the order for the process steps to be carried out to be new matter, Applicants have amended this paragraph in the specification to remove only those words and phrases that the Examiner considered to be new matter.

In Paper No. 9, the Examiner indicated allowability of claims 2 and 27. Applicants have amended claim 2 to include former claim 1 to place claim 2 along with depending claims 3, 6 and 9 in instant condition for allowance by this amendment.

In Paper No. 9, the Examiner indicated allowability of claim 27. Applicants have amended claim 27 to include the limitations of base and intervening claims 26 and 1 by this amendment to place claim 27 in instant condition for allowance.


Applicants also note that the Examiner has withdrawn from consideration method claims 23-25. However, the Examiner in Paper No. 9 has indicated allowability of claim 27. It is kindly submitted that claim 27 is a linking claim. Applicants request withdrawal of the restriction requirement as linking claim 27 is allowed. Applicants request the Examiner to honor MPEP §§ 809.03 and 821.04.

Applicants have also added claims 36 and 37 to claim that the cylindrical section of the nozzle hole is perpendicular to the substrate and to claim that the nozzle plate is made of a single integrated monolithic and homogenous unit. Since these claims depend from allowed 2, Applicants submit that there is no further search or consideration required on the part of the Examiner. Entry of and allowance of these claims is respectfully requested.

No fees are incurred by the filing of this amendment.

In view of the above, all claims are deemed to be allowable and this application is believed to be in condition to be passed to issue. Should any questions remain unresolved, the Examiner is requested to telephone Applicant's attorney.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATIONS

Please amend the paragraph which was inserted between paragraph 57 and paragraph 58 of Application originally filed by the Amendment filed on 24 June 2002, as follows:

It can be appreciated that the ink-jet printheads of the present invention can be manufactured by a process [starting with] of etching a channel into a bottom side of a silicon substrate and [then] etching a plurality of holes on a bottom of said channel of said substrate to perforate said substrate. It is noted that the substrate is a single integrated monolithic unit of preferably silicon, the silicon substrate having both the channels and the ink feed holes etched therein. [After the etching of the silicon substrate, electrodes] Electrodes or signal lines are deposited on a top side of the substrate. Resistive material is [then] deposited on the top side of the substrate electrically joining pairs of ends of electrodes that are located near each other. [Then the] The nozzle plate is attached to the top side of the substrate. The nozzle plate is perforated by a nozzle holes, each nozzle hole being positioned directly above a resistive layer joining the ends of a pair of signal lines. The resistive layer can be square in shape or essentially circular or omega in shape. The holes perforating the nozzle plate have a small diameter on a top side of the nozzle plate and have a larger diameter on the bottom side of the nozzle plate where the nozzle plate attaches to the top side of the substrate.

IN THE CLAIMS

Please cancel claims 1, 4, 5, 7, 8, 10, 15-19, 26 and 28-35 without prejudice or disclaimer as to their subject matter and amend claims 2 and 27 and newly add claims 36 and 37 by this amendment as follows:

1 2. (Amended) An ink-jet printhead, comprising:

2 a substrate being a single integrated monolithic and homogenous unit of silicon, said
3 substrate, having a rear surface, said rear surface having a channel having a predetermined depth,
4 wherein a plurality of ink feed holes are formed on a bottom of the channel perforating said
5 substrate;

6 a nozzle plate coupled to a front surface of the substrate, said nozzle plate being
7 perforated by a plurality of chamber-orifice complex holes, wherein each chamber-orifice
8 complex hole corresponds to at least one of said plurality ink feed holes; and

9 a plurality of heaters disposed on the front surface of the substrate, each one of said
10 plurality of heaters being located near corresponding ones of said plurality of chamber-orifice
11 complex holes, [The ink-jet printhead of claim 1,] wherein each one of said plurality of ink feed
12 holes is formed at a center portion of a corresponding one of said plurality of chamber-orifice
13 complex holes, and each one of said plurality of said heaters surrounds corresponding ones of
14 said plurality of ink feed holes.

1 27. (Amended) An ink-jet printhead, comprising:

2 a substrate being a single integrated monolithic and homogenous unit of silicon, said

3 substrate, having a rear surface, said rear surface having a channel having a predetermined depth,
4 wherein a plurality of ink feed holes are formed on a bottom of the channel perforating said
5 substrate;

6 a nozzle plate coupled to a front surface of the substrate, said nozzle plate being
7 perforated by a plurality of chamber-orifice complex holes, wherein each chamber-orifice
8 complex hole corresponds to at least one of said plurality ink feed holes; and

9 a plurality of heaters disposed on the front surface of the substrate, each one of said
10 plurality of heaters being located near corresponding ones of said plurality of chamber-orifice
11 complex holes,

12 said ink-jet printhead being manufactured by a process geared for mass production, said process
13 comprising the steps of:

14 etching said channel into a rear surface of said substrate;

15 etching a plurality of holes through to said front surface of said substrate to perforate said
16 substrate;

17 depositing a first plurality of signal lines and a second plurality of signal lines on said
18 front surface of said substrate, each one of said first plurality of signal lines terminating near
19 termination points of corresponding ones of said second plurality of signal lines, each of said
20 terminating portions of said first and said second signal lines terminating near at least one of said
21 plurality of holes perforating said front surface of said substrate;

22 depositing said heaters made of a resistive material onto said front surface of said
23 substrate so as to said connect terminating ends of each one of said first plurality of signal lines

24 with corresponding terminating ends of said second plurality of signal lines, said resistive
25 material being near to at least one of said plurality of holes perforating said front surface of said
26 substrate; and

27 attaching said nozzle plate perforated by said plurality of nozzle holes onto said front
28 surface of said substrate so that each one of said plurality of nozzle holes is aligned to
29 corresponding ones of terminating ends of said first and said second signal lines, said resistive
30 material, and at least one of said plurality of holes perforating said front surface of said substrate,

31 [The ink-jet printhead of claim 26,] said resistive material being essentially omega in shape and
32 surrounding corresponding ones of said plurality of holes perforating said front surface of said
33 substrate.